TRANSLATION NO. 2632

DATE: 30 October 1967

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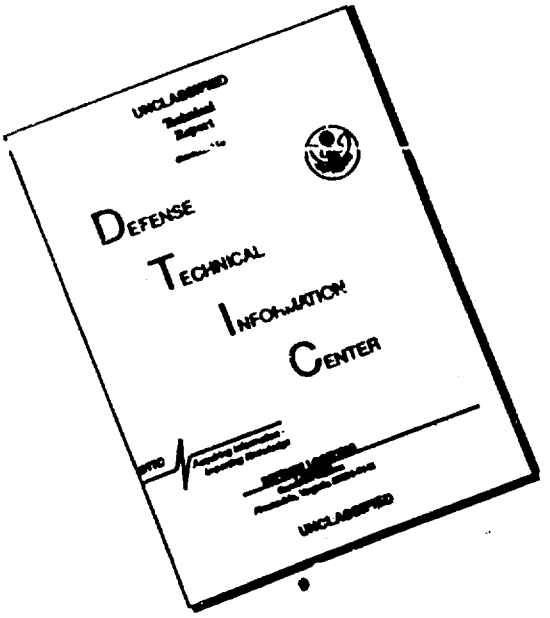

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A DOSIMETER-SPRAYER FOR LIVE INFLUENZA VACCINE

Voprosy Virusologii
(Problems in Virology)
No. 2, 1967, pages 243-246

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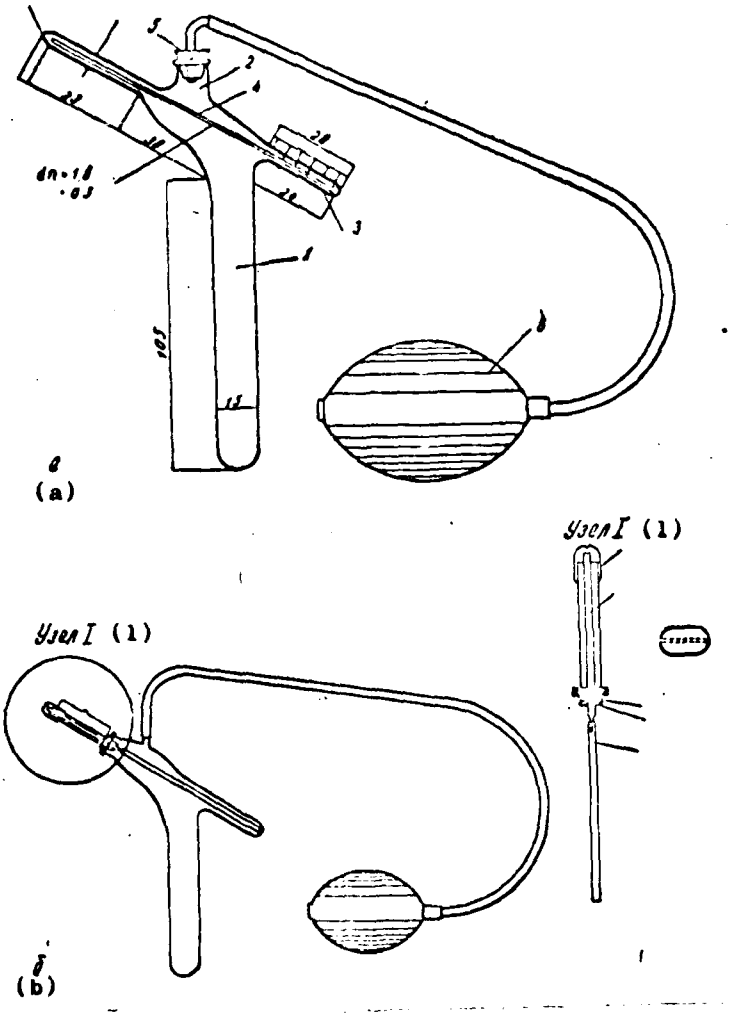
It is common knowledge that one of the most important conditions for ensuring the effectiveness of active immunization against influenza with live vaccine is correct administration of the vaccine with an accurately measured amount used in a fine spray [1, 2, 4, 6, 7].

Several investigators [3, 5, and others] mention the shortcomings of the present-day technique of vaccination using pipets and a variety of atomizers in which the amount of vaccine used is regulated by the number of squeezes of the bulb. The result is that either too little or too much vaccine is introduced into the nasal passages. This faulty technique affects the indices of reactivity, take, epidemiological and immunological effectiveness of the vaccination.

Several devices have been suggested in recent years for spraying live influenza vaccine into the nasal passages. They have both advantages and disadvantages, but all have the same major shortcoming -- they do not provide exact amounts of the vaccine. The lack of single instrument or apparatus for nasal spraying not only decreases the effectiveness of live influenza vaccine, but prevents the smooth operation of a mass immunization program. This led us to design a dosimeter-sprayer that meets the above specifications.

Our sprayer (cf. figure, a) is made of a hard transparent material. It consists of a receptacle for the liquid (1) connected to and communicating with the frame (2), gauge (3), inner tube (4)



Dosimeter-sprayer of liquid drugs. a - Variant 2; b - variant 2; 1 - Assembly 1

secured firmly to the bottom of the gauge and intended to lead the liquid to the nozzle, stopper with tube (5), and rubber bulb (6).

The sprayer is filled with vaccine through the opening in the rubber stopper (5). Just before use the apparatus is tilted to permit the liquid to fill the graduated (0.5 ml capacity) gauge and then returned to the original position. The rubber bulb (6) is squeezed and the exact amount of solution is forced into the inner tube (4) and sprayed at the outlet (2), where it mixes with the stream of air moving between the side of the frame and the tube.

Before large-scale testing of the device in an epidemiological experiment was started, a physical experiment was performed which showed the marked superiority of the device over the perfume atomizers now used for live influenza vaccine. Precisely graduated pear-shaped vessels were filled with live influenza vaccine by means of a dosimeter-sprayer and a controlled atomizer. Each type of device was used to fill 500 test tubes. The results, summarized in the table below, show that of the 500 test tubes filled by the dosimeter-sprayer, only in 20 (4%) was the dose somewhat less than that called for, 0.4 to 0.45 ml. The other 480 (96%) contained 0.5 ml of the vaccine. Of the 500 test tubes filled by the atomizer, the specified dose was found in only 110 (22%). The dose ranged from 0 to 1 ml in the other 390 test tubes.

Composite Data on the Dose of Live Influenza Vaccine Ejected by an Atomizer and a Dosimeter-Sprayer

(1) Число опытов	Прибор (2)	Выбор испрашиваемая доза (в мл) (3)																			
		0—0,1		0,2		0,3		0,4		0,5		0,6		0,7		0,8		0,9		1	
		(4) абс.	%	(4) абс.	%	(4) абс.	%	(4) абс.	%	(4) абс.	%	(4) абс.	%	(4) абс.	%	(4) абс.	%	(4) абс.	%	(4) абс.	%
500	(5) Дозатор-распылитель	—	—	—	—	—	—	20	4	480	96	—	—	—	—	—	—	—	—	—	—
500	Пульверизатор (6)	20	4	30	6	80	16	140	28	110	22	60	12	20	4	30	6	10	2	—	—

Key: 1 - Number of test tubes; 2 - Device; 3 - Dose ejected (in ml); 4 - abs.; 5 - Dosimeter-sprayer; 6 - Atomizer

Thus, despite the most precise graduation, atomizers eject different amounts of liquid. There are several reasons for this -- differences in pressure on the bulb (mostly at the beginning), degree of filling of the atomizer with vaccine, obstruction of the inner tube and impossibility of detecting it immediately, degree of tilting of the vessel, etc.

Our dosimeter-sprayer has been approved by the All-Union Institute of Patent Expertise and a number of research institute laboratories -- Influenza Laboratory (A. A. Kolchurin, Candidate of Medical Sciences, head) of the Moscow Control Institute of Medical and Biological Preparations imeni L. A. Tarasevich, Influenza Laboratory and Desiccation Laboratory (L. A. Parubel' and B. M. Parizh, heads) of the Moscow Institute of Virus Preparations, Virology Section (Prof. A. A. Smorodintsev, head) of the Institute of Experimental Medicine, USSR Academy of Medical Sciences, and Influenza Laboratory (V. G. Krasnova, Candidate of Biological Sciences, head) of the Dnepropetrovsk Institute of Epidemiology and Microbiology.

The results of the tests showed that the proposed dosimeter-sprayer is simple in design, easy to use, portable and that it automatically measures and disperses readily the amount of live influenza vaccine desired.

We took cognizance of the suggestions made by the research and industrial organizations that tested the device and made some improvements (cf. figure, b). Part of the glass frame is replaced with a metallic unit (1), which screws into the other part of the frame right where the receptacle for the liquid is held.

The advantage of the unit is that it contains a metallic capillary tube which goes into a vinyl chloride capillary tube that passes into a vinyl chloride capillary which touches the bottom of the gauge, on one side, and ends in a removable, easily sterilized metallic "olive", on the other. Besides the improvements mentioned above, the second variant can be easily manufactured.

Conclusions

1. A dosimeter-sprayer has been designed for the administration of live influenza vaccine.

2. The device is simple to use, easily produced, portable, simple in design, and sprays the vaccine in a fine mist.

3. A comparison of the accuracy of the dose of vaccine ejected by the sprayer and by the familiar type of atomizer showed the former to be clearly superior.

4. Further comparative studies are needed before the proposed device is widely used.

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